STUDY OF INFLUENCE OF VARIOUS POSTURES IN LABOUR OUTCOME

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CERTIFICATE

This is to certify that the dissertation titled **"STUDY OF INFLUENCE OF VARIOUS POSTURES IN LABOUR OUTCOME"** submitted by **Dr. K.MOHANA PRAMILA** to the faculty of Obstetrics and Gynaecology, The Tamilnadu Dr.M.G.R.Medical University, Chennai in partial fulfillment of the requirement for the award of M.D. Degree (Obstetrics and Gynaecology) is a bonafide research work carried out by her under our direct supervision and guidance.

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DECLARATION

I hereby declare that the study entitled **"STUDY OF INFLUENCE OF VARIOUS POSTURES IN LABOUR OUTCOME"** was done by me in the Institute of Obstetrics and Gynaecology (IOG), Madras Medical College, Chennai – 600 003, during the period of my PG study for MD Branch II Obstetrics and Gynaecology from 2008 - 2010.

This dissertation to Dr. M.G.R. Medical University is in partial fulfillment of university regulations for the award of MD Degree in Obstetrics and Gynaecology.

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CONTENTS

INTRODUCTION

Labour is always challenging and considered rebirth for a women. The position adopted naturally by women during birth has been described as early as 1882 by Engelmann. Different upright postures could be achieved by using posts, slung hammocks, furniture, Holding on to a rope, knotted piece of cloth or a woman could kneel couch or squat using bricks stones, a pile sand or a birth stool. Today a majority of women in deliver in a dorsal, semi recumbent or lithotomy position. It is claimed that the dorsal position enables the midwife / obstetrician to monitor the fetus better and then to ensure a safe birth.

Physiological advantages have been claimed for nonrecumbent labour, including an increase in pelvic dimension(1,2,3), smaller risk of aorto-caval compressions,(4) better 'alignment' of the fetus during passage through the pelvis,(5) more efficient uterine contraction(6,7) and enlisting the force of gravity.

This paper examines the historical background of different positions used, its evolution throughout the decades. We have reviewed the available evidence about the effectiveness, benefits and possible

disadvantages for the use of various postures during second stage of labour.

MAGNITUDE OF THE PROBLEM

The birthing position adopted by women is influenced by several factors, including instinctive behaviour and cultural norms. In parts of the developing countries (such as parts of Asia, Africa and the Americas) women who deliver at home with the help of traditional birth attendants or relatives use squatting or other upright positions chosen by the woman. Contrary to this cultural practice, almost all women who give birth at health-care facilities do so in supine recumbent position. It is conceivable that the lack of birthing position options at health-care facilities could be contributing to women choosing to give birth at home with unskilled persons rather than delivering at a health-care facility. In developed countries, where childbirth is medicalized, maternal, monitoring and clinical interventions during labour are thought to limit women's birthing position options. In the largest women's hospital in Europe, for example, local audit data demonstrate that 86% of women give birth in either supine or semi-recumbent position. Similarly in India majority of the

women delivering at health care facilities and hospitals use supine or semi – recumbent position. The identification of an optimum position with the possibility of improving clinical outcomes is therefore highly relevant to all women.

REVIEW OF LITERATURE

Historically a variety of positions have been used for delivery including standing, kneeling, squatting, semi sitting, lying dorsal or supine. Since ancient times there are documentary evidence that the non conventional postures during labour has the distinct advantage of gravitational force, increased uterine contraction and decrease in duration of second stage of labour**.** Atwood et al(8) has reviewed the rationale behind these various postures

Narol et al (9) and Newton et al (10) have reviewed the cross cultural preference for upright posture.

The review of literature aims at finding out not only the subjective comfort for the patient but also the scientific evidence to prove the alteration in the pelvimetry brought out by changes in postures.

SECOND STAGE OF LABOUR

The second stage of labour extends from the complete cervical dilation to the delivery of the fetus . It involves the major portion of the fetal descent and rotational movements. The efficiency of the descent mechanisms in assessed by measuring the rate of descent of the presenting part through the birth canal. This is preferable to judging the second stage solely by its length.

So the rate at which the active descent occurs is governed by several factors.

1. Uterine contractile force.
2. Voluntary maternal expulsive efforts
3. Fetal size, position and attitude.
4. Deformity of the fetal head.
5. Pelvic architecture.
6. Characteristics of pelvic floor.

INTRAUTERINE PRESSURE

In interpreting the uterine activity from the intrauterine pressure curve, the long sharp spikes overlying the uterine contraction curve were considered to represent pressures created by the maternal bearing down

efforts. Since the peak pressure of the spike exceeded the 100mmHg maximum value of the conventional monitor was remodeled to have a recorded range of 0-200mmHg. The bearing down pressure was represented as the mean value of the largest amplitude of the spike of each uterine contraction. Uterine contractility was quantified in modified Montevideo units.

Comparison of resting pressure between the sitting and supine position indicated that the mean resting pressure in the sitting position for both the nulliparous and multiparous was consistently higher than that in the supine position. Recent studies concerning uterine activity indicated that the resting pressure (11,12)and the uterine contractility(13,14,15) were increased and this may have shortened the labour in the upright position. It is agreed that uterine contractions are the main source of power during labour and the only power source in the first stage. But after the cervix is fully dilated the principal expulsive force is that produced by the bearing down efforts.(16,17)

"There is evidence to suggest that if the mother lies flat on her back then vena caval compression is increased, resulting in hypotension. This can lead to reduced placental perfusion and diminished fetal oxygenation.

The efficiency of uterine contractions may also be reduced". (Humphrey et al. 1974, Kurz et al. 1982)

Intrauterine pressure in various postures during second stage of labour

Postures	Intrauterine pressure in mmHg
Left lateral	120
Supine	125
Semi recumbent	135
Sitting	150

DURATION OF SECOND STAGE OF LABOUR

Traditionally, it has been thought that the upper limits of normal second stage were 2 hr in primigravidae and 1 hr in multigravidae, although the mean values of **Friedman(18,19)** were 57 min and 14 min. This is similar to the 41 min and 17 min respectively reported by **Studd (20)**. In their study of different racial groups 83% of normal primigravidae and 98.5% of normal multigravidae had a second stage of

less than 1 hr. The duration of the true length of second stage is of considerable clinical interest because fetal acidosis has been shown to

become more pronounced the longer the time between complete dilatation and delivery.

PERINEAL TRAUMA

Perineal trauma in relation to birth has been the subject of a number of analysis as described in the systemic review by Renfrew et al (21) women who gave birth in non supine position were more likely to retain an intact perineum than were women who delivered in the supine position. Women in the supine group had more severe lacerations(22,23,24,25). Fetal positions and maternal muscle strength were associated with episiotomy. Maternal bearing down efforts was significantly associated with lacerations.

ESTIMATED BLOOD LOSS

In a study by Terry et al(33) average estimate of blood loss for women delivering in the supine position was 358 ml, compared with

295 ml for women who delivered in nonsupine positions which is not statistically significant.

Nikodem(35) found an increased rate of post partum haemorrhage with the birthing chair due to increased venous pressure and engorgement of perineum which would cause greater blood loss with perineal trauma

MATERNAL PELVIS

Pelvic inlet: The line between the narrowest bony points formed by the sacral promontory and the inner pubic arch is termed obstetrical conjugate: It should be 11.5 cm or more. This anteroposterior line at the inlet is 2 cm less than the diagonal conjugate (distance from undersurface of pubic arch to sacral promontory). The transverse diameter of the pelvic inlet measures 13.5 cm.

Midpelvis: The line between the narrowest bone points connects the ischial spines; it typically exceeds 12 cm.

Pelvic outlet: The distance between the ischial tuberosities (normally > 10 cm), and the angulation of the pubic arch.

PELVIC TYPES

Traditional obstetrics characterizes four types of pelvises:

Gynecoid: Ideal shape, with round to slightly oval (obstetrical inlet slightly less transverse) inlet: best chances for normal vaginal delivery.

Android: Triangular inlet, prominent ischial spines, more angulated pubic arch.

Anthropoid: Inlet transverse is greater than inlet obstetrical diameter.

Platypelloid: Flat inlet with shortened obstetrical diameter.

Gardosi(26) and associated recommended squatting or semi squatting position using specialized pillow. They claimed that this shortens second stage of labour by increasing the diameter of pelvic outlet.

The relationship of the pelvic brim to the lumbar spine changes allowing the fetal head to enter the pelvis.

The ischial spines are no longer level allowing the fetal head to pass by these internal protrusions with ease.

The ligaments connecting the sacrum to the iliac are more flexible which allows them to lift up about 1-2 cm straightening the posterior

pelvic wall. This area is known as Rhombus of Michalis . This means that fetal head just prior to the beginning of involuntary pushing urge of the second stage, deflexes without obstruction. This will be observed when the woman is in supine position.

The woman tries to lift her bottom off the bed in response to fetal head pushing on the sacrum this happens when the woman is on her upright.

PELVIMETRY

Pelvimetry is the assessment of the female pelvis in relation to the birth of a baby. Pelvimetry used to be performed routinely to discern if spontaneous labour was medically advisable. Women whose pelvises were deemed too small received caesarean sections instead of birthing naturally. Research indicates that pelvimetry is not a useful diagnostic tool for CPD and that in all cases spontaneous labour and birthing should be facilitated. X-RAY Pelvimetry has the risk of exposure to the fetus hence not used routinely. MR Pelvimetry is becoming popular in assessing CPD. A woman's pelvis loosens up before birth (with the help of hormones), and an upright and/or squatting woman can birth a considerably larger baby. A woman in the lithotomy (lying on her back,

head of bed elevated) is more than likely not going to push a larger than average baby out, due to the size of outlet that this position creates. Since obstetricians continue to place women in this position for their requirement of 'access', not considering the birthing mother's needs to be in a better position to open her pelvis, it is more likely that women will be

given a potentially false diagnosis that their pelvis is too small to birth their baby.

MR PELVIMETRY

Evidence based medicine

As we need to practice evidence based medicine . MR pelvimetry in three positions proved feasible yielding diagnostic, quality images showing alterations in pelvic diameters in various postures.

Pelvic Measurements for 35 Women in Supine, Hand-to-Knee, and Squatting
REF: Russel JGB (3)

	Supine		Hand-to-Knee		Squatting	
Parameters	Mean ± SD (cm)	Range (cm)	Mean ± SD (cm)	Range (cm)	Mean ± SD (cm)	Range (cm)
Obstetric conjugate	12.4 ± 0.9	10.7-14.6	12.4 ± 0.8	10.5-14.0	12.3 ± 0.8	10.6-13.7
Sagittal outlet	11.5 ± 1.3	9.5-14.3	11.8 ± 1.3	9.6-14.6	11.7 ± 1.3	9.4-14.5
Interspinous diameter	11.0 ± 0.7	9.7-12.4	11.6 ± 1.1	10.1-14.4	11.7 ± 1.0	10.0-14.7
Intertuberous diameter	12.4 ± 1.1	10.1-15.5	12.5 ± 0.8	11.2-14.5	12.7 ± 0.8	11.3-14.6
Transverse diameter	12.9 ± 0.7	11.7-14.4	12.8 ± 0.7	11.8-14.0	12.8 ± 0.8	11.3-14.3

Dimensions in the three positions are listed in Table 1 and plotted in Figure 5.shows:

- The sagittal outlet was wider in the hand-to-knee and squatting positions than in the supine position (3 ± 5 mm, p = 0.002 and 2 ± 5 mm, p = 0.01, respectively).
- The interspinous diameter was greater in the hand-to-knee and squatting positions than in the supine position (6 ± 7 mm and 8 ± 7 mm; $p < 0.0001$ in both cases).
- Intertuberous diameter was greater in the squatting position than in the supine position (3 ± 7 mm, p = 0.01) but not greater than in the hand-to-knee position.
- The obstetric conjugate was the only parameter to be significantly smaller in the upright squatting position than in the supine position (2 ± 4 mm, p = 0.01) but not in the hand-to-knee position.

These results indicate that differences in posture can significantly increase female pelvic dimensions and thus provide objective

confirmation for time-honored parturient experience of the advantages of changing birthing position to facilitate vaginal birth. (Russel etal(3)

Cochrane pregnancy and child group s Trials Register (30 September 2005). updated 12 June 2009 :

The use of any upright or sidelying position compared with lying on your back with legs in stirrups are associated with the following results :

- Shortens the second stage of labour
- Small decrease in use of forceps and vacum
- fewer episiotomies
- Less chance of experiencing severe pains
- Fewer abnormal fetal heart tracing
- Small increased second degree tears

Increase in estimated blood loss although there was no evidence of serious long term problems from the extra blood loss

SUPINE POSITION

Advantages

- It provides the easier access to perineum for obstetrical intervention.
- It enables the obstetrician or nurse to listen to fetal heart rate at frequent
- intervals
-
- Makes the maintenance of asepsis easier.
- More comfortable for the person conducting the delivery

DISADVANTAGES OF SUPINE POSITION

With positions that close the birthing canal, such as lying down, there may be increased risk to the baby of:

- Increased need for forceps or vacuum delivery
- Broken clavicle/collarbone
- Excessive bruising
- Pressure on baby's neck vertebras
- Excessive head molding
- Compression of umbilical cord
- Stress on baby

- Poor position/angle of the fetus in relation to the pelvis
- Brachial plexus injury
- Broken humerus
- Disruption of the baby’s oxygen supply

Increased risk for the mother of:

- Less effective contractions
-
- Labor slowing and not progressing
- Possible increased hypotension & pregnancy-induced hypertension
- Ineffective pushing
- May lead to illusion of cephalo-pelvic disproportioin due to reduced pelvic diameters from poor positioning
- Increased risk of need for Cesarean section
- Strain and tearing to the mother's tissues
- Episiotomy
- Back pain
- Fractured coccyx/tailbone

Janet Balaskas the recognized pioneer of natural childbirth and author of “Active Birth” reiterates the danger of being in a supine position:

“In the semisitting position the mother’s weight rests on her coccyx and the pelvic capacity is reduced.” “In the semireclining position the sacrum is immobile and the pelvic outlet narrows.” “Your coccyx is designed to move out of the way as your baby’s head descends. Sitting on your coccyx during birth restricts the pelvic outlet and can also lead to

dislocation of the coccyx, which can be extremely painful for months after the birth.”

The sacrococcygeal joint, the joint between the sacrum and the coccyx or tailbone, also softens in pregnancy; it is designed to swivel backwards to widen the outlet of the pelvis as the baby emerges. Of course, this is impossible if the mother is sitting on her coccyx.

BENEFITS OF PROPER POSITIONING

Opening the birth canal by using positions that support a woman’s anatomy, will decrease the risk of possible trauma to the baby and mother’s body. .Moving around during labor and using birthing positions

such as left side-lying, hands and knees, upright, squatting, etc. offer several benefits:

- Increased comfort
- Reduced pain
- An enhanced sense of control and involvement in the birth
- More effective contractions
- Better progression of labor
- Baby more likely to descend in an optimal position
-
- Work with gravity instead of against it
- Better blood and oxygen supply to the baby

SQUATTING

Squatting is highly effective in facilitating the descent and birth of the fetus. It is considered to be the best position for the second stage of labor (**Lowdermilk & Perry** , 2003).(27)

ADVANTAGES

- Decreases the amount of time mother pushes during labor.

- Reduces the necessity for forceps use on infant.
- Lessens the use of episiotomy to aid in labor, due to “relaxing and stretching of the pelvic floor muscle.
- Shortens the depth of birth canal.
- Increases pelvic diameter by 10 percent.
- Encourages and strengthens the intensity of contractions, while relieving back pressure.
- Improves blood circulation of fetus.
- Improves health care practitioner’s access to mother’s perineum.
-
- May increase pelvis diameter by as much as two centimeters.
    - Uses gravity to assist with birthing process.

DISADVANTAGES

- Use of this position is exhausting to mother.
- The health care practitioner monitoring the infant may have difficulty hearing fetal heart tones.

- This position impairs the mother's ability to assist in delivery.

STANDING

ADVANTAGES

- This position allows to remain upright. It increases the diameter of pelvis by 1 cm due to downward pressure on maternal pelvis.
- It takes advantage of gravity during and between contractions.
- Baby is in line with the angle of pelvis.
- Standing may increase the urge to push in second stage of labour.

DISADVANTAGES

- Most uncomfortable posture for the midwives\obstetricians conducting the delivery.

SITTING

- It is good position for resting.
- It has more gravity advantage than lying down.
- Electronic fetal monitoring can be done.
- Shortens the duration of second stage of labour.
- Uterine pressure and expulsive force is more when compared to supine posture.

LITHOTOMY

ADVANTAGES

- It allows the easiest access to the mother to give episiotomy, for using forceps, for vacumn extraction.

DISADVANTAGES

- It narrows the pelvic outlet.
- It places pressure on the tailbone

- It places undue stress on perineum and increasing the risk of tearing
-
- It works against gravity
- It increases the second stage of labour

KNEELING / KNEE CHEST POSITION

- It relieves back ache
- This position assists rotation of baby in posterior position
- It still makes possible to have vaginal examination

LEFT LATERAL POSITION

ADVANTAGES

- Greater control of the fetal head during birth.
- Greater relaxation and less tension of the perineal muscles.
- Fewer perineal lacerations and decreased need for episiotomy.

- A familiar, comfortable position for the woman which is conducive to rest between contractions and the preservation of her dignity.
- Facilitates the management of shoulder dystocia.
- Increases fetal oxygenation by avoiding the supine hypotensive syndrome.
- Perineum is constantly under observation and accessible during delivery.
- Vaginal exam and perineal inspection are facilitated.
-
- Easily assumed, adaptable position for delivery.
- Decreases some delivery complications.

DISADVANTAGES

- Large episiotomy is difficult to cut.
- Difficult to repair an extensive episiotomy and lacerations.
- Unsuitable for the application of difficult forceps.

- The woman giving birth must have control of her legs and may need help with positioning.
- Complications of the third stage are difficult to manage.

Meta-analyses of birthing position studies suggest that the benefits of upright posture include a shorter second stage of labor, a small reduction in assisted deliveries, and a decreased episiotomy rate but an increased risk of severe blood loss . The advantages of the traditional supine and left lateral positions include better patient access—for example, for administering an anesthetic. It can also be physically stressful for the patient to maintain the squatting position for a long time.

AIM OF STUDY

To asses the impact of non-conventional posture during the second stage of labour, in the management of labour and to compare the

- Duration of second stage of labour
- Force of uterine contraction.
- Maternal and fetal outcome.

in these different posture with conventional supine posture.

STUDY DESIGN

Prospective non-randomised study.

MATERIALS AND METHODS

PATIENT SELECTION

500 woman in labour are studied as to the labour pattern and delivery in different postures.

POSTURE	NO. OF CASES	MULTIGRAVIDA	PRIMIGRAVIDA
SUPINE	250	224	26
SITTING	85	76	9
SQUATTING	100	85	15
LEFT LATERAL	65	51	14

ALL SUBJECTS ARE MATCHED ACCORDING TO AGE AND PARITY

MATERIALS

Ergonomically designed delivery table and delivery table

WHO modified partograph

Tocodynamometer using conventional CTG AMTSL

INCLUSION CRITERIA

- Primigravida
- Multigravida
- Age- 25 to 32 yrs
- Ht 150 to 165 cm
- No contraindication for vaginal delivery.
- No contraindication for any position.
- No medical /surgical complication.

EXCLUSION CRITERIA

- Teenage pregnancy
- Elderly gravida
- Short statured women
- Bad obstetric history
- Contraindication for any of the positioning
- Contraindication for vaginal delivery
- Other medical surgical complications

- Pregnancy associated complications in previous pregnancy – retained placenta, PPH etc.

Methodology

This is a non-randomised controlled trial of 500 women in labour that took place in Institute of Obstetrics and Gynaecology, Chennai between 2008 to 2009 . Potential participants were given the option of taking part in the study and told they could choose either supine or non-supine posture. Women subjected to this study are low risk with no obstetric or neonatal complications present or expected.

Women were counselled for inclusion in the study at an antenatal clinic visit or women in early labour or women with false pains. The study was explained to them in vernacular and informed consent obtained for conducting delivery at any position. 250 women were allocated to non conventional postures like squatting, sitting and left lateral by turn of numbers starting with squatting position 250 were allocated to supine postures. Written consent were obtained for the preferred postures. As the women come in spontaneous labour the details were reviewed.

Thus the two groups were similar for all obstetric parameters. Both primi and multigravida were included. Majority of the women in the study are mutigravidas. Thus they are able to compare the previous birthing experience with the present. Birth companion is encouraged and

the patients in both groups had physical and moral support from the family members.

Until the beginning of the second stage of labour the management of the groups was identical with women being encouraged to walk, sit and recline. In both groups fetal monitoring was done according to the standard practice of interval auscultation and conventional CTG was done as per hospital protocol.. Routine management of labour was unchanged.

SUPINE

For conventional supine posture delivery was accomplished with mother in supine posture on delivery bed supported by the birth companion.

SQUATTING

Delivery table shown in the fig no:12 was used for the squatting posture. Table is adjusted so that the mother can assume squatting posture during contractions and can rest between contractions by reclining on the

back rest. Birth companion support her on both sides steadied the women as she squatted during contraction and as she beared down, the women was encouraged to sit back and rest in between contractions. During delivery perineum can be supported or episiotomy can be given. The infant is delivered in the same posture and given to the mother after

routine care. Placenta was also delivered in the same posture and any perineal laceration or episiotomy was sutured in the usual manner in obstetric table with the patient in lithotomy.

SITTING

Delivery in sitting posture was conducted in the table shown in the Fig no: 13,14. This table has got electrically driven height adjustable features and back rest movements so that it reduces the operator strain. First stage of labour is managed routinely, during the second stage of labour, patient is made to assume the sitting posture on the delivery table shown. During contractions patient is asked to bear down and to rest in between the contractions. As the head is crowning the height of the table is raised for the better accessibility of the perineum. Episiotomy can be given if required with good perineal support the infant is delivered in the same posture. Placenta was also delivered in the same posture. The

perineal laceration or episiotomy can be easily sutured by putting the patient in lithotomy position in the same table .

LEFT LATERAL POSITION

The women about to give birth may find it helpful to be in left lateral position before the time of birth. The surface on which the birth will take place should be flat – delivery table or birthing bed. Head is

only slightly elevated, if the head is elevated higher, a lateral curve is created in women's spine which can inhibit the progress of descent during second stage. The women's torso should be aligned in a c shaped curve to allow the pushing efforts to follow the curve of Carus which will assist the fetus through the birth canal during the second stage. The position is facilitated by flexing the women's hips and bending the knees to the degree that is most comfortable to her. The women may grasp her right knee or leg for pushing or she may grasp her birth companion. Her buttock should be placed at the edge of bed of the table. The women's leg need not be separated too much for the birth of the infant. Birth companion can support the right leg or it can be held by stirrups.

Hand placement for left lateral birth The practitioner attending the birth may find that the usual placement of the hands for birth in the left lateral position is awkward, due to the 90 degree rotation of the woman's

body. With the woman in the left lateral position, the practitioner faces the woman's perineum and places the right hand on the infant's head, with the fingers directed toward the woman's suprapubic area. Great care must be taken not to place the fingers on the delicate vaginal tissues, which can lead to periurethral lacerations. Before crowning, the pads of the right-hand fingertips are placed on the vertex with enough pressure to maintain flexion, with the entire right hand in a cupped position. As the head

proceeds to crown, the fingertips are moved towards the occiput and the head becomes entirely cupped in the right hand. Pressure is released slowly on the head as the face is born over the perineum. The left hand is placed in a position to support the perineum and to determine the size of the head. A sterile gauge is placed over the rectum to prevent contamination. The thumb and forefinger of the left hand are spread apart and placed on the perineal tissues in such a way as to allow full view of the midline perineum.Placed in this fashion, the right hand exerts gentle pressure to help maintain flexion of the fetal head and controls the speed of extension of the head, while the left hand provides perineal support and can control the speed of birth of the head, if necessary. This hand placement assists the head to be born with the narrower suboccipitobregmatic diameter presenting at the time of crowning while allowing complete visualization and assessment of the condition of the

perineum during the birth process. The placement of a mirror at the foot of the bed allows the woman to observe the entire birth, or she may be able to observe the birth directly through her partially separated legs. As the infant is born, the face is wiped of excess mucus, and the nose and mouth are suctioned, if necessary. The shoulders are assisted in the usual manner. Third stage of labour is managed by putting the patient in the supine position.

Data on the following variables were collected.

1 Duration of second stage of labour

2 Uterine pressure at the onset and at the peak of the second stage

3 Need for episiotomy

4 perineal lacerations

5 APGAR / NICU admission

6 Maternal perception of pain.

7 Overall maternal mental satisfaction.

Uterine pressure was measured using the tocodynamometer of the conventional CTG, maternal perception of pain was analysed using visual analog scale

Data were analysed using Chi square, unpaired t test

Software used was SSP

RESULTS AND ANALYSIS OF DATA

AGE GROUP IN CONVENTIONAL AND NON-CONVENTIONAL POSTURES

AGE	CONVENTIONAL SUPINE	NON-CONVENTIONAL		
		Squatting	Sitting	Left lateral
20 – 25 yrs	134	46	38	25
	53.6%	46.0%	44.7%	38.5%
26 – 32 yrs	116	54	47	40
	46.4%	54.0%	55.3%	61.5%
Total	**250**	**100**	**85**	**65**

PARITY AMONG CONVENTIONAL AND NON-CONVENTIONAL CLASSIFICATION

PARITY	CONVENTIONAL SUPINE	NON-CONVENTIONAL CLASSIFICATION		
		Squatting	Sitting	Left lateral
Primigravida	26	15	9	14
	10.4%	15.0%	10.6%	21.5%
Multigravida	224	85	76	51

	89.6%	85.0%	89.4%	78.5%
TOTAL	250	100	85	65

DURATION OF II STAGE OF LABOUR IN CONVENTIONAL AND NON-CONVENTIONAL GROUP

DURATION OF II STAGE LABOUR AMONG THE NON-CONVENTIONAL GROUP

P Value	**95% Confidence interval of the difference**	
	Lower	**Upper**
0.000 (<0.05)	**0.19309**	**0.79091**

The duration of second stage of labour is reduced considerably in non-conventional postures. Among the conventional supine postures , 4% of the women delivered in 10 minutes, 25% delivered at the end of 20 minutes and 75% delivered at the end of 30 minutes. In non-conventional posture 5.4% delivered in 10 minutes, 42% delivered in 20 minutes, 86% delivered at the end of 30 minutes. Among the non conventional postures duration of 2nd stage of labour is reduced in both sitting and squatting posture.

The effect of posture on duration was significant with 95% CI of 0.19 - 0.79 at its lower and upper limits. It is statistically significant (0.000)

UTERINE PRESSURE AT THE ONSET OF SECOND STAGE OF LABOUR IN CONVENTIONAL AND NON-CONVENTIONAL GROUP

UTERINE PRESSURE AT THE PEAK OF SECOND STAGE OF LABOUR IN CONVENTIONAL AND NON-CONVENTIONAL GROUP

UTERINE PRESSURE AT THE ONSET OF SECOND STAGE OF LABOUR IN NON CONVENTIONAL GROUPS

UTERINE PRESSURE AT THE PEAK OF SECOND STAGE OF LABOUR IN NON CONVENTIONAL GROUP

UTERINE PRESSURE AT THE ONSET OF SECOND STAGE OF LABOUR

P Value	95% Confidence interval of the difference	
	Lower	Upper
0.000 (<0.05)	0.87244	0.92756

UTERINE PRESSURE AT THE PEAK OF SECOND STAGE OF LABOUR

P Value	95% Confidence interval of the difference	
	Lower	Upper
0.000 (<0.05)	-10.8861	-8.6898

The uterine pressure is maximum in the nonconventional group when compared to the conventional group both at the onset as well as at the peak of 2nd stage of labour. Maximum uterine pressure can be obtained by putting the patient in squatting posture. Whereas at the onset of 2nd stage of labour 33% of conventional group had a uterine pressure of 91-110 PSI nearly 83% in non-conventional group had the same pressure during the peak of 2nd stage of labour the same trend was noted with non-conventional group showing 12% of them having highest uterine pressure of greater than 120 PSI as against the maximum of 111 -120 PSI in the conventional group that too in the 1 % of the women. Statistical analysis showed 95% CI at the onset of 2nd stage of labour to be 0.87 at the upper limit and 0.92 at its lower limit, this was statistically significant(0.000). 95% CI at the peak of 2nd stage of labour to be 0.88 to 8.68 at its lower and upper limit the same was statistically significant (0.000)

STATE OF PERINEUM IN CONVENTIONAL AND NON-CONVENTIONAL GROUP

STATE OF PERINEUM	GROUP		Total
	Supine	Non Supine	
INTACT	34	85	119
	13.6%	34.0%	23.8%
FIRST DEGREE TEAR	28	90	118
	11.2%	36.0%	23.6%
SECOND DEGREE TEAR	131	47	178
	52.4%	18.8%	35.6%
THIRD DEGREE TEAR	15	4	19
	6.0%	1.6%	3.8%
EPISIOTOMY	42	24	66
	16.8%	9.6%	13.2%
Total	250	250	500
	100.0%	100.0%	100%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	105.351[a]	4	.000
Likelihood Ratio	109.867	4	.000
Linear-by-Linear Association	56.034	1	.000 (<0.05)
N of Valid Cases	500		

STATE OF PERINEUM AMONG THE NON-CONVENTIONAL GROUP	

STATE OF PERINEUM	**NON CONVENTIONAL**			
	Squatting	**Sitting**	**Left lateral**	**Total**
INTACT	34	38	13	85
	13.6%	15.2%	5.2%	34.0%
FIRST DEGREE TEAR	13	44	33	90
	5.2%	17.6%	13.2%	36.0%
SECOND DEGREE TEAR	39	3	5	47
	15.6%	1.2%	2.0%	18.8%
THIRD DEGREE TEAR	3	0	1	4
	1.2%	.0%	.4%	1.6%
EPISIOTOMY	11	0	13	24
	4.4%	.0%	5.2%	9.6%
TOTAL	100	85	65	250
% of Total	40.0%	34.0%	26.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	85.901[a]	8	.000
Likelihood Ratio	98.891	8	.000
Linear-by-Linear Association	.114	1	.735
N of Valid Cases	250		

Need for episiotomy is 16.8% in conventional group and 9.6% in non conventional group More women in the non-conventional group had intact perineum and first degree lacerated perineum whereas women in conventional group had higher degrees of perineal lacerations which is statistically significant (0.000)

Among the non-conventional group women in sitting posture had more number of intact perineum and no one had episiotomy. Women in squatting posture had more number of 2nd degree perineal tears. More number of episiotomies among the non conventional group is in the left lateral position.

BIRTH WEIGHT GROUP-CONVENTIONAL/NON-CONVENTIONAL

BIRTH WEIGHT IN NON-CONVENTIONAL GROUP

NICU ADMISSION CONVENTIONAL/NON-CONVENTIONAL

NICU ADMISSION IN NON-CONVENTIONAL GROUP

P Value	95% Confidence interval of the difference	
	Lower	Upper
0.453 (not significant)	-0.76287	-0.63713

MATERNAL PERCEPTION OF PAIN IN CONVENTIONAL VS NON-CONVENTIONAL GROUP

	GRADES OF PAIN	GROUP		
		Supine	**Non-Conv**	**Total**
	Mild	25	61	86
		10.0%	24.5%	17.2%
		5.0%	12.2%	17.2%
	Moderate	51	93	144
		20.4%	37.3%	28.9%
		10.2%	18.6%	28.9%
	Severe	80	56	136
		32.0%	22.5%	27.3%
		16.0%	11.2%	27.3%
	Extreme	94	39	133
		37.6%	15.7%	26.7%
		18.8%	7.8%	26.7%
	Total	250	249	499
		100.0%	100.0%	100.0%
		50.1%	49.9%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	54.298[a]	3	.000
Likelihood Ratio	55.671	3	.000
Linear-by-Linear Association	51.685	1	.000
N of Valid Cases	499		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 42.91.

MATERNAL OF PERCEPTION OF PAIN CONVENTIONAL/NON-CONVENTIONAL						
	Grades of Pain	**Supine**	**Squatting**	**Sitting**	**Left-Lat**	**Total**
	Mild	25	21	26	14	86
		10.0%	21.0%	30.6%	21.9%	17.2%
		5.0%	4.2%	5.2%	2.8%	17.2%
	Moderate	51	33	29	31	144
		20.4%	33.0%	34.1%	48.4%	28.9%
		10.2%	6.6%	5.8%	6.2%	28.9%
	Severe	80	30	15	11	136
		32.0%	30.0%	17.6%	17.2%	27.3%
		16.0%	6.0%	3.0%	2.2%	27.3%
	Extreme	94	16	15	8	133
		37.6%	16.0%	17.6%	12.5%	26.7%
		18.8%	3.2%	3.0%	1.6%	26.7%
	TOTAL	250	100	85	64	499
		100.0%	100.0%	100.0%	100.0%	100.0%
		50.1%	20.0%	17.0%	12.8%	100.0%

Chi-Square Tests

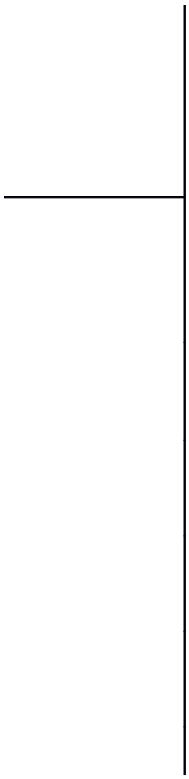
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	64.613[a]	9	.000
Likelihood Ratio	65.020	9	.000
Linear-by-Linear Association	46.577	1	.000
N of Valid Cases	499		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.03.

The pain perception using the visual analog scale was found to be more in the supine posture. Nearly 70% of them perceived the pain to be severe and extreme whereas 39% perceived the pain to be severe and extreme in non conventional group. It also showed a statistical significance(0.000) . One woman was unable to comprehend the idea and give any answer

OVERALL MATERNAL MENTAL SATISFACTION IN VARIOUS POSTURES.

Overall Maternal Mental Satisfaction	Supine	Squating	Sitting	Left Lateral	TOTAL
Very Unhappy	3 0.6%	3 0.6%	0 0%	0 0%	6 1.2%
Slight Unhappy	12 2.4%	4 0.8%	2 0.4%	1 0.2%	19 3.8%
Satisfied	92 18.4%	32 6.4%	8 1.6%	9 1.8%	141 28.3%
Very Satisfied	87 17.4%	23 4.6%	38 7.6%	33 6.6%	181 36.3%
Very Happy	56 11.2%	38 7.6%	37 7.4%	21 4.2%	152 30.5%
TOTAL	250	100	85	64	500



Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	**51.533[a]**	**12**	**.000**
Likelihood Ratio	**56.995**	**12**	**.000**
Linear-by-Linear Association	**24.747**	**1**	**.000**
N of Valid Cases	**499**		

a. 7 cells (35.0%) have expected count less than 5. The minimum expected count is .77.

The overall satisfaction was good in both groups but more women experienced very happy (19%) in non-conventional group compared to 11% in the conventional group. However the satisfactory level was more in the conventional group (18%) than in the non-conventional group, this might probably due to more number of multigravid women who were used to the conventional posture. The satisfactory levels were statistically significant (0.000). One woman was unable to comprehend the idea and give any answer.

DISCUSSION

Many women wish to become more involved in decision making during childbirth, many women feel that squatting in labour is appealing , research has shown that western women have difficulty in adapting this position. Birthing chairs and other aids have been designed to facilitate some form of upright position during parturition.

The data collected in this study on Intrauterine pressure, duration of second stage of labour, state of perineum, APGAR, Birth weight, NICU admission, maternal perception of pain, overall maternal satisfaction were all compared with the results of various studies to know the outcome.

Women included in this study were of the age group of 20-32 years. 87.2% of the women were multigravidae. More number of multigravidae were included in this study because they were able to compare their previous birthing experience with the present one and tell their experience with respect to convenience of the posture, perception of

pain and overall mental satisfaction . Primigravidae constituted around 12.8% .This is comparable to the study by Chin et al (28) .

Uterine pressure

In this study the uterine pressure is measured both at the onset of the second stage of labour and at the peak of second stage of labour. It was found that The uterine pressure is maximum in the nonconventional group when compared to the conventional group both at the onset as well as at the peak of 2nd stage of labour. Maximum uterine pressure can be obtained by putting the patient in squatting posture.Whereas at the onset of 2nd stage of labour 33% of conventional group had a uterine pressure of 91-110 PSI nearly 83% in non-conventional group had the same pressure during the peak of 2nd stage of labour the same trend was noted with non-conventional group showing 12% of them having highest uterine pressure of greater than 120 PSI as against the maximum of 111 -120 PSI in the conventional group that too in the 1 % of the women. Statistical analysis showed 95% CI at the onset of 2nd stage of labour to be 0.87 at the upper limit and 0.92 at its lower limit, this was statistically significant(0.000). 95% CI at the peak of 2nd stage of labour to be 0.88 to 8.68 at its lower and upper limit the same was statistically significant (0.000)

The intrauterine pressure is maximum in women who delivered in squatting position and they had a good expulsive force which shortened the duration of second stage of labour. The women in the non-conventional group , the uterine contractions were more frequent and

sustained when compared to women who delivered in the supine posture. This maybe due to the elimination of supine hypotension which leads to adequate uterine perfusion.

In the study by Chin et al(28) – Sitting position labour and uterine activity- comparison of the resting pressure between the sitting position for both the nulliparous and multiparous was constantly higher than in supine position. During the 2nd stage of labour, the pressure in the sitting position increased acutely and was significantly higher than in the supine position (60.4 versus 36.7 mmHg, $P<0.05$). In the multiparous the mean bearing down pressure rose to 19.4 mmHg in the sitting position and was higher than in the supine position and was statistically significant which is similar to this study.

In randomized controlled trial by **P.R.de Jong** et al (29) women in the squatting posture had increased intrauterine pressure than women in supine posture which is similar to the present study.

In a study by **Joyce Roberts** et al(30) the sitting position was considered to be the most efficient for expulsive efforts, and the left lateral the least. In this study women delivering in left lateral posture had the uterine pressure which is more than that of the women delivering in supine posture.

Duration of 2nd stage of labour

In this study The duration of second stage of labour is reduced considerably in non-conventional postures. Among the conventional supine postures , 4% of the women delivered in 10 minutes, 25% delivered at the end of 20 minutes and 75% delivered at the end of 30 minutes. In non-conventional posture 5.4% delivered in 10 minutes, 42% delivered in 20 minutes, 86% delivered at the end of 30 minutes. Among the non conventional postures duration of 2nd stage of labour is reduced in both sitting and squatting posture due to more frequent and sustained uterine contraction and good expulsive forces in these postures.

The effect of posture on duration was significant with 95% CI of 0.19 - 0.79 at its lower and upper limits. It is statistically significant (0.000)

In a randomized controlled trial by **P.R.de Jong et al(29)** the duration of 2nd stage of labour in two groups were similar, which contradicts this study.

In the study by **Chin et al(28)** the duration of second stage of labour is shorter in sitting posture due to increased uterine pressure in this posture which was similar to this study.

In a randomised study by **Gupta et al(31)** duration of second stage of labour is reduced in squatting posture when compared to supine posture which was similar to this study.

Cochrane's review concluded use of upright position for 2nd stage of labour confers several benefits including a shorter second stage **Gupta et al(32)** with 95% CI 2.95 -5.64 minutes which was statistically significant which was similar to this study.

PERINEAL LACERATIONS

In this study need for episiotomy is 16.8% in conventional group and 9.6% in non conventional group More women in the non-conventional group had intact perineum and first degree lacerated

perineum whereas women in conventional group had higher degrees of perineal lacerations which is statistically significant (0.000)

Among the non-conventional group women in sitting posture had more number of intact perineum and none had episiotomy, this is because this posture had good access of perineum and is more convenient in giving good support to the perineum . Women in squatting posture had more number of 2nd degree perineal tears this is due to less access to the perineum and inadequate perineal support. More number of episiotomies among the non conventional group is in the left lateral position.

In a non-randomised controlled trial on post partum outcomes in supine and non supine deliveries by Terry etal (33) almost 3 times as many women delivering in non supine were left with intact perineum compared with women in supine group. 22% perineal lacerations in non supine group were limited primarily to the first degree tears – 30% whereas women in the supine group sustained more severe lacerations - 67% which is similar to this study.

Study by P.R.de Jong et al(29) , women in the upright group were subjected to fewer episiotomies than women delivering in the supine position which is similar to this study.

In a randomized controlled trial By Mazloom. R.S et al(34) incidence of episiotomies and perineal lacerations are less in left lateral position as compared to supine position . This posture is safe method of delivering and recommended for protection of perineum which is similar to this study.

Blood Loss

In this study the blood loss in the non conventional posture is similar to the blood loss in the conventional posture. This is comparable to the study done by Terry et al(33), involving 198 women, in which the average estimate of blood loss for women delivering in the supine

position was 358 ml,compared with 295 ml for women who delivered in nonsupine positions.

Nikodem(35) found an increased rate of post partum haemorrhage with the birthing chair due to increased venous pressure and engorgement of perineum which would cause greater blood loss with perineal trauma in a randomized study involving 50 parturients in sitting posture. In this study involving 85 parturiants in sitting posture there is no incidence of post partum haemorrhage with the chair lifted up and with good perineal support.

MATERNAL PERCEPTION OF INTRAPARTUM PAIN AND OVERALL MATERNAL MENTAL SATISFACTION

In this study most of the women in non conventional group experienced mild to moderate pain. Where as severe and extreme pains were perceived mostly by women in the conventional group. Women in the conventional group experienced back discomfort than non conventional group when followed postnatally.

In this study the most comfortable posture for women is sitting. They had less perception of intrapartum pain and less back discomfort. This may be due to the cushion effect of the birthing chair. This posture is also more convenient for the person conducting the delivery than the other non-conventional posture. 26 out of 100 women in squatting

posture found it difficult to squat, but managed to deliver in squatting posture, by resting in between contractions. The women who delivered in left lateral position were also very satisfied with this posture.

In a study by **Ela –Joy Lehrman(36)** most women who have given birth in the left lateral position have a favorable response to the experience. Most are amazed that back discomfort is diminished. Left lateral position may be more highly adaptable to both the normal and complicated birth . Women may be more comfortable and retain their dignity in giving birth in this posture which is comparable to the present study.

According P.R.de Jong et al(29) intrapartum pain is much less in upright posture and reqirement of analgesia is also less with upright posture. Women who delivered in sitting posture are more satisfied with this posture.

According to Terry et al(33) in postpartum outcome of supine delivery vs nonsupine delivery , perception of pain , postnatal back discomfort were much less in non supine postures. The perception of intrapartum and postpartum pain in these two studies were similar to the present study.

There is no difference in birthweight and NICU admissions, 5 minute APGAR between the two groups in this study and is similar to study by terry et al.(33)

CONCLUSION

Duration of 2nd stage of labour is reduced in the sitting, squatting and left lateral posture.

The contraction pressure is more in non conventional posture than that of the conventional supine posture.

The need for episiotomy and 3rd degree perineal tears are less in non-conventional postures when compared to the conventional postures.

Maternal perception of pain is reduced in non-conventional postures.

The overall maternal mental satisfaction is more in non-conventional postures.

Results of the study could be used for explaining the advantages of each postures and to make the women in labour to choose the best and most comfortable posture during labour with confidence.

PROFORMA

Name of the Patient:

Age:

Ip No:

Occupation:

Socio-economic status:

Height:

Weight:

Obstetric score:

Posture:

Time of onset of 2nd stage of labour :

Time of delivery:

Duration of 2nd stage of labour:

Uterine pressure at the onset of 2nd stage of labour:

Uterine pressure at the peak of 2nd stage of labour :

State of Perineum:

Fetal Outcome:

Maternal Perception of Pain:

Overall Maternal Mental satisfaction:

Remarks:

BIBILIOGRAPHY

1. Borrel V,Fenstrom1. The movements at the sacroiliac joint and there importance to change in the pelvic dimensions during parturition- Acta obstet gynaecol scand1957; 36:42-47

2. Russel JGB The rationale of primitive delivery positions Br.J.obstet gynaecol 1982; 89:712-715

3. Russel JGB. Moulding of the pelvic outlet. *J Obstet Gynaecol Br* 1969; 76:812-820.

4. Scott DB, Kerr MG. Inferior vena caval compression in late preg*nancy. J. ObstetGynaecolBrEmp* 1963; *70: 1044-1046.*

5. Gold EM. Pelvic drive in obstetrics: an X-ray study of 100 cases. *Am J. Obsrer Gynecol1950;* 59: *890-894*

6. Caldeyro-Barcia R, Noriega-Guerra L, Cibils LA et al. Effect of position changes on the intensity and frequency of uterine contractions during labor. *Am Jobstet Gynecol1960;* 80: *284-290.*

7. Mendez-Bauer *C,* Arroyo J, Garcia Ramos A. Effects of standing position on spontaneous uterine contractility and other aspects of labor. *JPerinatMed 1975;* 3: *89-100.*

8. At wood et al parturition posture and related birth behaviours Acta obstet gynaecol scand 57:1-23,1976

9. Narol F et al postions of women in child birth AmJ obstet and gynaecol 82:943-954,1961

10. Newton et al pregnancy childbirth and outcome: a review of patterns of culture and future research needs Williams and Williams 1967;8:95-106

11. Mitre IN;The influence of maternal position on duration of active stage of labor. Int J Gynaecol Obstet 12:181,1974

12. Mori HY,Chen SZ,Aisa ka KZ et al; The physiological role of the sitting parturient posture.Asia-oceania J Obstet Gynaecol 11:47,1985

13. Liu YC; Effects of an upright positions during labor AM J Nurs74:2203,1974

14. Mendez-Bauer C,ArroyoJ,Garcia C,et al;effects of standing position on spontaneous uterine contractility and other aspects of labor J perinat Med 3;89,1975

15. Caldeyro-BacriaR:The influence of maternal posion during second stage of labor.ICEA Review 2:31,1978

16. Pritchard JA,Mac DonaldsPC Gant NF: Williams obstetrics seventeenth edition. Norwalk, CT, Appleton-Century-crofts 1985,p311

17. Greenhill JP,Friedman EA:Biological principles and modern practice of obstetrics Philadelphia,W.B.Saunders 10.,1974 pp199-201

18. Friedman FA : primigravida labor: A graphicostatistical analysis Obstet & Gynaecol 6:570 1975

19. Friedman FA: multigravida labor: A graphicostatistical analysis Obstet & Gynaecol 8:692, 1956

20. Studd J: The partographic control of labor. Clinics of Obstet & Gynaecol 2:127-151, 1975.

21. Renfrew MJ, Hannah W, Albers L, Floyd E. Practices that minimize trauma to the genital tract in childbirth: a systematic review of the literature [review]. *Birth*. 1998;25:143–160.

22. Lydon-Rochelle MT, Albers L, Teaf D. Perineal outcomes and nurse-midwifery management. *J Nurse Midwifery*. 1995;40:13–18.

23. Albers LL, Anderson D, Cragin L, Daniels SM, Hunter C, Sedler KD, et al. Factors related to perineal trauma in childbirth. *J Nurse Midwifery*. 1996;41:269–276.

24. Olson R, Olson C, Cox NS. Maternal birthing positions and perineal injury. *J Fam Pract*. 1990;30:553–557.

25. Roberts JE, Kriz DM. Delivery positions and perineal outcome. *J Nurse Midwifery*. 1984;29:186–190

26. Gardosi J, Hutson N, B-Lynch C. Randomised controlled trial of squatting in the second stage of labour. *Lancet 1989;* 1: *74-77*

27. Lowdermilk & Perry Nursing care during labour and birth. J.Maternity nursing 2003;65:320-372.s

28. Chin et al sitting position labor & uterine activity Obstet & gynaecol 1987; 69:67-72

29. P.R.DE Jong et al British journal of Obstet &Gynaecol May 1997;104:567-571

30. Joyce Roberts J. of Nursing Midwifery 1980;25:74-78

31. Gupta et al Squatting in second stage of labor The Lancet Sept.1989; 334:561-562

32. Gupta JK, Hofmeyr GJ –Position for women during second stage of labor. Cochrane Database syst Rev.2004(1) CD00 2006

33. Terry et al Postnatal outcome in supine delivery vs non-supine delivery JAOA April 2006;106:199-202.

34. Mazloom R.S et al Journal of Mazandaran university of medical sciences 2005; 15: 57-64

35. Nikodem VC. Upright vs recumbent position during the second stage of labour. In: Enkin MW, Keirse MJNC. Renfrew MJ et al., editors. *Pregnancy and Childbirth Module. Cochrane Database of Systematic Reviews.* Review No. *03335;* 1 July *1992.* Cochrane Updates on Disk. Oxford: Update Software, Disk Issue *2, 1994.*

36. Ela Joy Lehrman Journal of Nurse Midwifery Aug 1985; 30: 129-130